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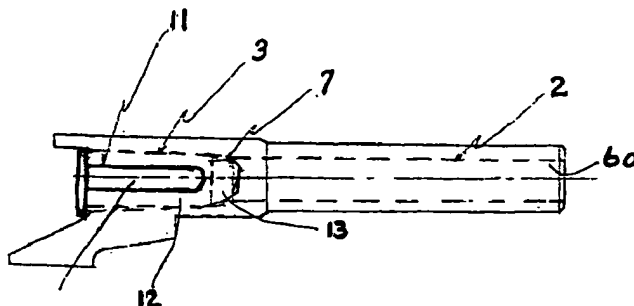
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(54) **DISPOSITIF EMPECHANT TOUT TIR REEL A L'AIDE D'UNE
ARME A FEU AUTOMATIQUE**

(54) **LIVE FIRE EXCLUSION FOR AUTOMATIC FIREARMS**



(57) Arme à feu avec canon modifié, équipée d'un orifice de dégagement de pression formé dans la chambre et permettant, si on tire par erreur une cartouche normale chargée au lieu d'une cartouche sous-calibrée, d'avoir une mise à feu contrôlée.

(57) A firearm modified with a subcalibre barrel has a pressure-relief orifice formed in the chamber to allow a full size, live round to burst in a controlled manner in the event that such a round is inadvertently loaded into the weapon.

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ABSTRACT

A firearm modified with a subcalibre barrel has a pressure-relief orifice formed in the chamber to allow a full size, live round to burst in a controlled manner in the event
5 that such a round is inadvertently loaded into the weapon.

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Title: LIVE FIRE EXCLUSION FOR AUTOMATIC FIREARMS

Field of the Invention

This invention relates to the field of firearms and provisions for modifying semi-automatic and fully automatic
5 firearms for training purposes. In particular, it relates to a safety feature for firearms that have been modified to fire blanks or sub-calibre, low energy ammunition.

Background to the Invention

In military and police firearms applications almost
10 all the ammunition consumed is used in training. For some
training purposes, however, normal ammunition is not adequate.
An alternate type of known training ammunition represented by
United States Patent No. 5,359,937 fires a low mass projectile
relying on a special cartridge design to provide cycling of
15 recoil-operated automatic weapons.

When such training rounds are being employed, it is important to ensure that no weapon is loaded with standard, live ammunition. An advantage of the lighter-weight training ammunition is that it has a shorter range and lower penetration capacity. This permits use of smaller, less secure firing ranges as training facilities. If standard ammunition were accidentally employed in these facilities,

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unexpected dangers would arise from the increased striking power and range of standard ammunition.

To provide increased security when training rounds are being employed, it has become conventional to provide firearms with substitute barrels which are bored to fire a smaller calibre round than standard ammunition. If an attempt is made to chamber a standard round in a training-adapted firearm, then the barrel will not normally admit entry of the standard projectile. This ensures that such modified weapons cannot fire standard, live ammunition. Other examples of systems for converting standard firearms for operation with sub-calibre ammunition vis U.S. Patent Nos. 4,515,004 and 4,531,446.

As one of the objectives in providing training ammunition is to simulate use of a normal weapon as nearly as possible, it has been customary to modify standard weapons only to a minimum extent. In particular, subcalibre training rounds are employed which have standard-sized casings. This allows all parts of the weapon concerned with the loading and cycling functions to operate in a nearly normal fashion. To accommodate reduced recoil as provided by the cartridges of U.S. Patent No. 5,359,937, springs and other secondary components may also be modified.

It has been found that standard ammunition may be capable of being loaded into a barrel-modified weapon if the

projectile is pressed back into the casing. In certain cases, reduced propellant is provided in training cartridges providing room in the casing for the projectile to be pressed therein, shortening the cartridge. By so shortening the
5 cartridge, it is possible that a live round has been chambered within a weapon with a modified barrel. Upon firing such a round, the projectile or a part thereof, can be extruded by the high chamber pressure to travel down the barrel and out the muzzle at a sufficiently high velocity to cause serious
10 bodily harm should it inadvertently strike a human target. Conversely, should the projectile jam in the barrel and block it the pressure build-up will blow open the breech at considerable risk to the operator.

This invention addresses such a situation. In
15 particular, this invention provides a safety feature which
will prevent any portion of the projectile from exiting the
muzzle when a live cartridge is chambered and fired in a
firearm having a barrel bore of reduced diameter. This is
effected by allowing the cartridge casing to burst in a
20 controlled manner without danger to the operator.

In certain prior art firearms, the chambers of such
firearms have been provided with pressure-relief orifices
located rearward of the cartridge to serve as an escape path
for gases that may blow-back (e.g. from a burst primer cap).
25 Such orifices have been in the nature of a small hole that

penetrated through the chamber wall of the firearm rearward of the cartridge casing. By allowing for a secondary path for gases to escape upon firing, the bolt and slide mechanism barrel were protected against extreme over-pressures arising
5 from the use of a defective cartridge.

Such a relieve orifice was also effectively present in early black-powder firearms that were fired through a touch-hole.

In the prior art, however, no example is known of
10 provision for a casing to burst in the chamber and release pressure through a pressure-relief orifice in the chamber wall.

The invention in its general form will first be described, and then its implementation in terms of specific
15 embodiments will be detailed with reference to the drawings following hereafter. These embodiments are intended to demonstrate the principle of the invention, and the manner of its implementation. The invention in its broadest and more specific forms will then be further described, and defined, in
20 each of the individual claims which conclude this Specification.

Summary of the Invention

According to one aspect of the invention a firearm is provided with a chamber for receiving a cartridge having a

casing with a casing sidewall. The chamber is provided with a pressure-relief orifice that extends through the chamber wall to terminate adjacent to the casing sidewall. The orifice is of sufficient diameter to allow the casing to burst
5 on firing and vent its gases through the pressure-relief orifice, in the event that an excessive pressure condition builds-up within the casing.

In particular, the invention is suited to weapons having a barrel with a reduced bore diameter and a chamber
10 that will accommodate a standard sized round with a standard diameter casing and projectile.

As a further feature of the invention, the pressure-relief orifice may preferably be in the shape of one or more elongated slots, for example of an elongated, oval shape, that
15 are oriented in parallel with the axis of the cartridge. More preferably, such a slotted orifice may be located towards the rearward end of the chamber wall. Further, it may extend so as to run-out rearwardly so as to form a "u" shaped opening in the chamber wall.

20 While the invention is of value with weapons converted to fire sub-calibre ammunition, it may also be utilized in weapons converted to fire blanks. An example of such a system is depicted in U.S. Patent No. 5,433,134 wherein the conversion barrel is substantially restricted by a plug
25 with a choking orifice.

The foregoing summarizes the principal features of the invention and some of its optional aspects. The invention may be further understood by the description of the preferred embodiments, in conjunction with the drawings, which now
5 follow.

Summary of the Figures

Figure 1 is a side view of a conventional automatic pistol indicating the barrel and chamber portions.

Figure 2 is a sectioned side view of a prior art
10 conversion pistol barrel of reduced bore diameter.

Figure 3 is a view as in Figure 2 with the presence of an elongated pressure relief slot formed according to the invention, in the chamber wall of a pistol barrel wherein the slot runs-out at the rearward end of the chamber wall.

15 Figure 4 is a top view of an automatic rifle or machine gun barrel modified by the presence of an oval, elongated pressure-relief orifice formed according to the invention in the top mid-portion of the chamber wall.

Figures 5a and 5b are side views of cartridge
20 casings after they have been fired in barrels with modified chambers in accordance with the invention corresponding to Figure 3 (pistol casing) and Figure 4 (rifle or machine gun casing) respectively.

Description of the Preferred Embodiment

In Figure 1 an automatic pistol 1 is provided with a barrel 2 having a chamber 3 and a slide 4 with an ejection slot 5.

5 In Figure 2 a conversion pistol barrel of prior art design is shown wherein the barrel 2 has a bore 6 of reduced diameter providing a conical forcing cone end 7 to the chamber 3. A cartridge 8 with a sub-calibre projectile 9 and full-sized casing 10 is shown chambered in the barrel.

10 In Figure 3 a pistol barrel modified according to the invention has a pressure relief orifice 11 in the form of a longitudinal extending opening that runs-out at the rearward end of the chamber 3 to provide a "u" shaped slot in the chamber wall that penetrates through to terminate adjacent to
 15 the casing 10 of the cartridge 12. The cartridge 12 is a live round with a full sized projectile 13 shown compressed back into the casing 10 from its normal position. This represents a hypothetical situation where the live round 12 has been forced into the chamber 3 notwithstanding the reduced diameter
 20 of the barrel bore 6a.

Figure 4 is a top view of the barrel of an automatic rifle or machine gun. The wall of the chamber 3 is provided with a pressure-relief orifice 11a in the form of a central, elongated oval.

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The casing 10 of a cartridge inserted in the barrel of Figure 4 (not shown) would partially burst along the portion of the casing wall that is adjacent to the pressure-relief orifice 11a. The casing wall 14 would thereby be
5 sheared or torn to provide an opening of extended length to form in the casing wall 14, facilitating the release of pressurized gas from the cartridge 12.

In most cases, the slide 4 in a pistol or the bolt 17 in a rifle must be circled manually in order to remove the
10 spent cartridge 9,10 through the ejector slot 5.

Figures 5a and 5b show casings 10 after being removed from a modified pistol or rifle/machine gun respectively with the burst openings 14 apparent. The use of a pressure-relief orifice 11a of elongated shape, oriented
15 parallel to the cartridge axis, provides a preferred formation of the burst openings 14. For example, the positioning of the pressure-relief orifice 11 at the rearward end of the pistol chamber 3, preferably running-out at the rearward edge of the chamber 3, allows the burst opening 14 to commence anywhere
20 along the casing 10, but most likely near the cap end 16 of the casing 10, extending down the side of the casing 10. By extending the slot for almost the full length of the chamber 11, casings 10 can be caused to split along virtually their full length.

While use of a single pressure-relief orifice has been shown, for security against excessive pressure build up, two or more such orifices may be employed at spaced locations around the circumference of the chamber 3.

5 Tests have been conducted in 9mm SIG P226, SIG 228, SIG 229, Browning HP, Glock 17, Colt M16/K4, Beretta 92/96 and Smith & Wesson 59 hand guns amongst others modified with reduced diameter barrel bores to fire FX^R rounds supplied by SNC Industrial Technologies Inc. of Quebec, Canada. The
10 machined slot or pressure-relief orifice for the run-out slots was 5/32 inch wide and 0.02-0.03 inches less than the chamber length. Oval slots were approximately three times their width in length. In no case did a normal-sized projectile proceed down the reduced diameter barrel bore. In all examples, the
15 casings burst releasing the propellant gases generated by such rounds.

Conclusion

The foregoing has constituted a description of specific embodiments showing how the invention may be applied
20 and put into use. These embodiments are only exemplary. The invention in its broadest, and more specific aspects, is further described and defined in the claims which now follow.

These claims, and the language used therein, are to be understood in terms of the variants of the invention which

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have been described. They are not to be restricted to such variants, but are to be read as covering the full scope of the invention as is implicit within the invention and the disclosure that has been provided herein.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY ARE CLAIMED AS FOLLOWS:

1. A firearm having a chamber and a loading mechanism
for loading standard size cartridges having a standard
5 diameter projectile and casing into said chamber wherein said
barrel has a reduced bore diameter below the diameter for
standard projectiles and said chamber is of a size that will
accommodate a round with a standard diameter projectile and a
standard diameter casing sidewall, said chamber being provided
10 with a pressure-relief orifice that extends through the wall
of the chamber to terminate adjacent to the location of the
casing sidewall when a cartridge is loaded into the chamber,
said orifice being of sufficient diameter to allow the casing
to burst and vent its gases on firing through the pressure-
15 relief orifice in the event that a pressure condition builds-
up within the casing that is in excess of a pre-selected
limit.

2. A firearm as in Claim 1 wherein said pressure relief
orifice is in the shape of one or more elongated slots that
20 are oriented in parallel with the axis of the cartridge.

3. A firearm as in Claim 2 wherein said orifice is
located at the rearward end of the chamber wall, running-out

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rearwardly so as to form a "u" shaped or elongated oval opening in the chamber wall.

4. A firearm as in Claim 3 wherein said slot extends for substantially the full length of the chamber of said
5 firearm.

5. A conversion barrel for an automatic recoil operating firearm, said barrel having a barrel portion with a bore and a chamber portion, the diameter of the chamber portion being greater than the diameter of the bore, there
10 being formed in the chamber wall a pressure-relief orifice of sufficient diameter to allow the casing to burst and vent its gases on firing through the pressure-relief orifice in the event that a pressure condition builds-up within the casing that is in excess of a pre-selected limit.

15 6. A barrel as in Claim 5 wherein said pressure-relief orifice is in the shape of one or more elongated slots that are oriented in parallel with the axis of the cartridge.

7. A barrel as in Claim 6 wherein said orifice is located at the rearward end of the chamber wall, running-out
20 rearwardly so as to form a "u" shaped opening in the chamber wall.

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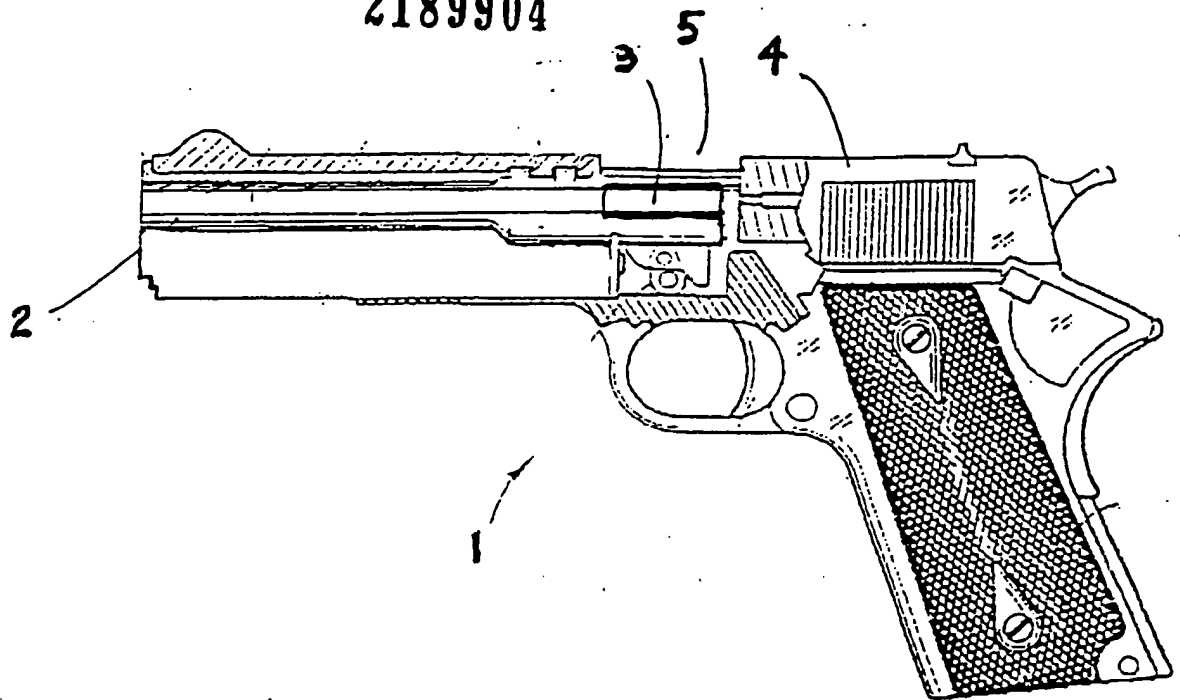


FIG. 1 - PRIOR ART

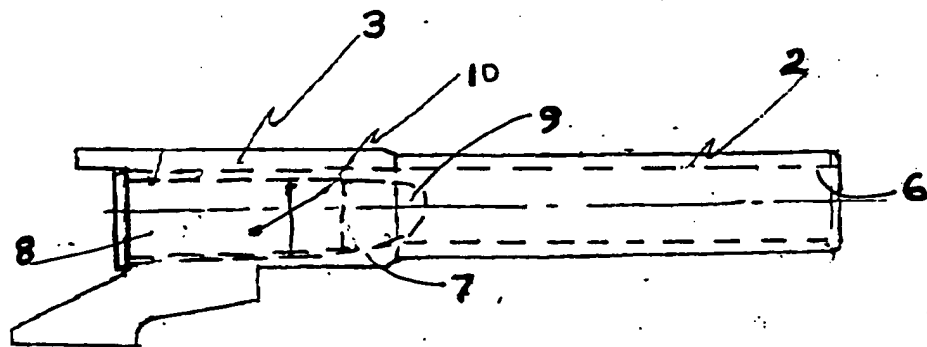


FIG. 2 - PRIOR ART -

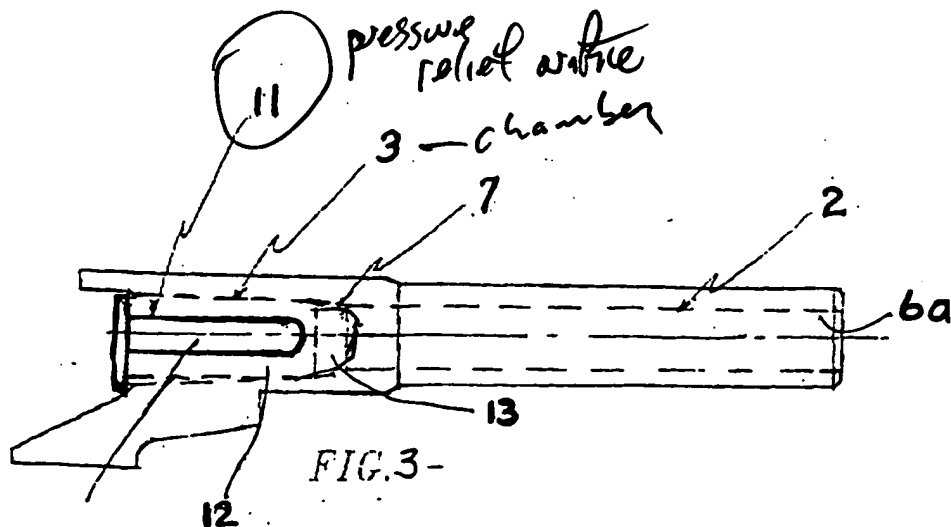
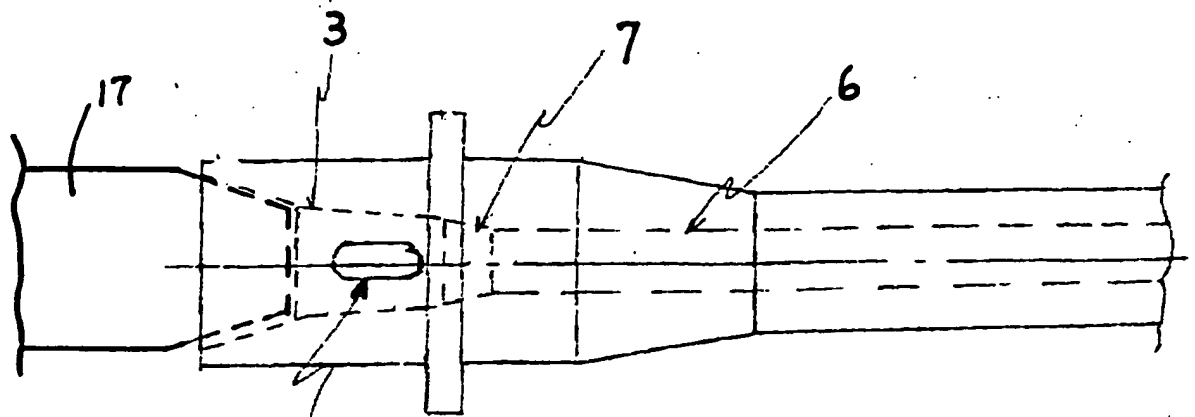


FIG. 3 -

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11a

FIG. 4 -

pressure relief
valve

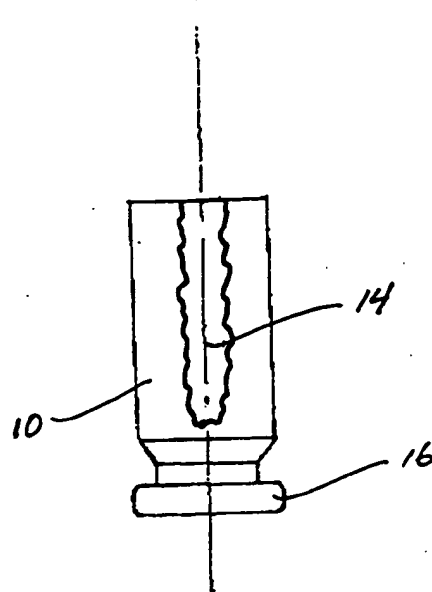


Figure 5a .

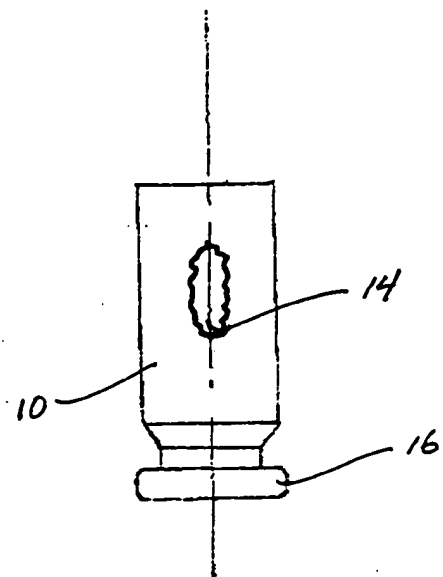


Figure 5b

DERWENT-ACC-NO: 1998-428414

DERWENT-WEEK: 199837

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TITLE: Firearm for modifying semi- and fully-
automatic firearms
sufficient diameter for training purpose - has orifice of
firing through allowing casing to burst and vent gases on
condition pressure-relief orifice in event that pressure
pre-selected builds-up within casing that is in excess of
limit

INVENTOR: DIONNE, S; FRAPPIER, R

PATENT-ASSIGNEE: SNC IND TECHNOLOGIES INC[SNCIN]

PRIORITY-DATA: 1996CA-2189904 (November 8, 1996)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
PAGES MAIN-IPC		
CA 2189904 A	May 8, 1998	N/A
017 F41A 021/28		

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO
APPL-DATE		
CA 2189904A	N/A	1996CA-2189904
November 8, 1996		

INT-CL (IPC): F41A021/28

ABSTRACTED-PUB-NO: CA 2189904A

BASIC-ABSTRACT:

The firearm has a chamber and a loading mechanism for loading standard size cartridges including a standard diameter projectile and casing into the chamber. The barrel has a reduced bore diameter below the diameter for

standard projectiles. The chamber is of a size that will accommodate a round with a standard diameter projectile and a standard diameter casing sidewall.

The chamber has a pressure-relief orifice that extends through the wall of the chamber to terminate adjacent to the location of the casing sidewall when a cartridge is loaded into the chamber.

The orifice is of sufficient diameter to allow the casing to burst and vent its gases on firing through the pressure-relief orifice in the event that a pressure condition builds-up within the casing that is in excess of a pre-selected limit.

ADVANTAGE - Provides a safety feature which prevents any portion of the projectile from exiting the muzzle when a live cartridge is chambered and fired in a firearm having a barrel bore of reduced diameter.

CHOSEN-DRAWING: Dwg.3/5

TITLE-TERMS: FIREARM MODIFIED SEMI AUTOMATIC FIREARM TRAINING PURPOSE ORIFICE

	SUFFICIENT DIAMETER ALLOW CASING BURST VENT GAS FIRE
THROUGH	PRESSURE RELIEF ORIFICE EVENT PRESSURE CONDITION BUILD UP
CASING	EXCESS PRE SELECT LIMIT

DERWENT-CLASS: Q79

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: N1998-334397